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## A HIGH-SCHOOL COURSE IN FIELD GEOGRAPHY

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The great importance of field work in all the natural sciences has long been recognized. If its need is any more pressing in one group of sciences than in another those sciences are geography and geology. Field geography obviously does not mean the naming and locating of cities, capitals, rivers, etc., but involves the recognition and interpretation of geographic features with special reference to plant and animal life, especially human life. Geography is primarily a field subject and only secondarily a textbook or schoolroom subject. Mountains, plains, plateaus, glaciers, arid and moist climates, with their life relationships, cannot be brought to the student. He can read *about* them but fail completely to recognize them in the field. This is well illustrated by a young university graduate who accompanied our party last season. He had "read about terminal moraines" and "wanted to see what one looked like." After riding for hours over the irregular surface of one, climbing some of its slopes so steep that he had to walk and urge his horse up after him, after camping for several days on the shores of a beautiful lake held in by it, after ascending the old glacial valley that had supplied the material for the moraine, the young man secured an appreciation of a common natural feature that his entire high school and university training had failed to give him. Since such a vital part of geography teaching lies out of doors, what is the teacher to do? The obvious answer is, Go out of doors and do it. But this is far easier said than done and no one has satisfactorily solved the problems of field work, especially in secondary schools.

For several years I have conducted local field work with my classes, but always have felt the need of more extended work. During the past five years there have been many enthusiastic field students in my classes, and they have frequently suggested that a

long-distance trip be taken to study many of the interesting things about which they had read but which they could not study at first hand. This suggestion with a definite plan of execution was presented to Principal Franklin W. Johnson, of the University High School, and met with his hearty approval. The school, as is to be expected, was not prepared to underwrite the expense of such an expedition and, therefore, I assumed the financial responsibility. The entire cost was met by members of the party. The result was the establishment in the University High School of a distinct course in field geography, open to any boy in the school, and offering a half-unit credit. To assure a party, and lessen the individual expense, boys not seeking credit were admitted. Contrary to the opinion of some, this plan added to the interest of the whole party, rather than detracted from it. In fact, it was a common occurrence to find non-credit boys arguing over a field problem or attending the conferences to learn about the things they were seeing.

The trip, therefore, aimed first to accomplish a successful course in field geography, including the constant use of topographical and geological maps and such instruments as the compass and aneroid barometer, but at the same time secured vigorous, healthy out-door exercise in the pure mountain air. It also placed together in the intimacy of camp life a group of strong, active boys; a situation that soon brings out the good and weak qualities of every individual, and a situation that forces the individual to correct his weakness. Only those who have camped with boys—walked, ridden, eaten, played, slept with them, day after day—can appreciate how quickly the strong and weak points are discovered, and with what relentless energy a boy's weaknesses are kept before him until he recognizes and corrects them. This "rubbing up against his fellows," learning to smile in sunshine, in rain, or in snow, to overcome obstacles that have seemed insurmountable to him, is an education within itself, at least to many. Perhaps it is worth as much, or more, than the course in geography itself.

#### REGION SELECTED

The portions of our own country that offer suitable conditions for field geography are very numerous, but the region selected was the

Jackson Hole country of Wyoming and the Yellowstone National Park. The journey to this region offered an excellent opportunity to study the climatic change from the moist Chicago region to the aridity of Utah and Idaho. It also took the class across plains, mountains, and plateaus, with their accompanying changes in altitude, climates, and life relationships. Jackson Hole is the name applied to a broad flat-bottomed valley in northwestern Wyoming. It is about 45 miles north by south and about 15 miles east by west, and is bordered on the west by the Teton Mountains, and on the east and south by other ranges. There are only two roads leading into this region from the west and only trails or very poor roads from the east and south. A good road enters the region from the north leading out of Yellowstone Park. All these roads are relatively modern. From this description it will be seen that this region was well-nigh inaccessible in pioneer days, and even today it cannot be reached during part of the year except on snow shoes. In the early days of Wyoming this inaccessibility made it the hiding-place of horse and cattle thieves. Those days are gone, but the same physical conditions prevail and make it an oasis of the American frontier. A few hardy settlers have pushed over the mountains into this oasis and are truly on the frontier of the settlement that has grown up around them. The telephone now extends into the region and, when it works, helps to keep the settlers in touch with the outside world. Evidence of the frontier spirit is shown in the complete pleasure that a whole family enjoys in traveling 75 to 125 miles across a mountainous country to attend a harvest jubilee or to celebrate the Fourth of July. Even then the place of meeting may be from 30 to 40 miles from the nearest railroad.

From the viewpoint of geography and its allied sciences this region presents many interesting features for study. The Snake River which traverses the area from north to south has cut terrace upon terrace from its gravel filled floor, while glaciers have plowed out U-shaped valleys in the bold, rugged Tetons, and, depositing the drift in semicircular ridges at the mountain base, have formed numerous beautiful lakes. Here the boy has the opportunity on many side trips to traverse regions seldom if ever visited by man

and study at first hand the work of Nature in its undisturbed condition. There is something that inspires a boy to the love of Nature as he is guided through a pathless mountain region and realizes that he is seeing things and treading ground that very few, if any, have ever trodden before.

As Jackson Hole is an oasis in the American frontier in which a few pioneers are now collected, so is it an oasis for many wild animals. There are now within its area about 20,000 elk, the last of the thousands that once inhabited our western mountains. During the summer they feed along the mountain sides, especially east of the Hole, but during the winter they descend in great herds to the grasslands along the Snake River and its tributaries. Most of this area is a national forest and game preserves, which assures the protection and conservation of wild life. It is evident therefore that besides being a rich field for geographic study Jackson Hole offers the great advantage of being little changed by man.

The splendid opportunities for study in Yellowstone Park are so well known that they require no discussion here. Few places in the world possess such an array of hot springs, geysers, waterfalls, canyons, vulcanism, and glaciation; geological features that have been the antithesis of each other, occurring in the same region, present to a boy with great forcefulness the variations in the earth's history.

#### METHOD OF TRAVEL AND ROUTE

The party left Chicago in a special sleeping-car attached to the regular train. This car was used exclusively by the party throughout the entire rail journey. The route followed led through Omaha, Denver, Royal Gorge of the Arkansas River, across the Rocky Mountains by way of Tennessee Pass, Salt Lake City, and to St. Anthony, Idaho. Stops were made at Denver and Salt Lake City. At St. Anthony traveling clothes were exchanged for field clothes, each boy was provided with a saddlehorse, and the 500-mile journey overland began.

Provisions for such a journey must be carried from the start, and together with camp equipment and personal baggage require several four-horse wagons, the number required varying with the size of the party. Last season the party consisted of 15 boys, 2 instruct-

ors, and 6 employees. Twenty-seven horses were used besides a few extras hired to help over especially bad roads. Several extra saddlehorses are always taken along, as numerous accidents may happen, such as sickness, or a horse may be lost permanently by straying at night, or he may break through the crust of a hot spring while grazing and be scalded to death. All these things are liable to occur the same season. Stray horses have the habit of herding with elk, and it is well-nigh impossible to catch them.

A route was followed southeast from St. Anthony, crossing the Teton Mountains by way of Teton Pass and entering Jackson Hole near the southern end, thence north along the east flanks of the Tetons to the south entrance of Yellowstone Park. Several days were spent in camp and in making side trips in the Jackson Hole region. The first camp in the Park was on Lewis Lake, and side trips were made to Pitchstone Plateau, Heart Lake, and the Red Mountains, from which came most of the lava covering the surrounding country. From this camp the party journeyed to Yellowstone Lake, Yellowstone Canyon, Mount Washburne, Tower Falls, Mammoth Hot Springs, Lower and Upper Geyser Basins, and other side trips were made to the crest of the Gallatin Mountains and Shoshone Lake. After a last look at Old Faithful, the return journey was begun and the Park was left behind at Yellowstone, Montana. From this point the trip to Chicago was made by way of Pocatello and Cheyenne across the bad lands of Wyoming.

#### CHARACTER OF FIELD MATERIAL STUDIED

*Climate.*—The question naturally arises, What kind of field work can be done successfully with a class of this kind? Obviously nothing of such detailed nature as would satisfy a field geologist or any other field specialist should be attempted. In the following outline no attempt is made to describe fully just what was done or to give a description of the country traversed. But it is designed to show that there is an abundance of material suitable for study.

Probably the first large problem that confronts the student is the change in climate as he passes from Chicago to Utah and Idaho. He has had textbook knowledge of the situation, but this portion of the journey lays before him a partial climatic cross-

section of the United States. As he crosses Illinois, Iowa, and eastern Nebraska, he is confronted by excellent farms, well-kept farm homes, and a luxuriant growth of agricultural and natural vegetation. This luxuriance dwindles into grasslands and sage brush as he approaches the Rockies, and into barren desert, in which the human struggle for existence is successful only where irrigation prevails, as he crosses eastern Utah. In the heart of Utah he finds an oasis—made so by irrigation—and learns to appreciate the hardiness of those early pioneers who crossed the deserts to establish a new colony. It is not unusual to hear a boy say, "Let them have it. They certainly earned it." In this region he notices the distinct terraces extending along the mountain sides, and finds in Great Salt Lake the remnant of an ancient lake whose waves cut the terraces that now stand many hundreds of feet above the present lake level. What must have been the climatic conditions at that time? Did the ancient lake have an outlet? Was it always salty? What caused the change? What were the conditions at home at the time? are some of the problems that arise at once. In crossing the mountains he is confronted with the climatic change with altitude. He has read about it, but careless covering at night emphasizes the fact. He notes the tree line and barren snow-capped peaks, the abundance of trees on one side of a range and the sparsity on the other and demands an explanation. If interested in photography he notes the clear sky and clear air and seeks directions for proper exposure. If he is working for credit he is keeping notes on all he sees and following his route on the maps. In the Park he finds that the same region has experienced periods of sedimentation, vulcanism, glaciation, and hot springs. These appear at first as very conflicting climatic conditions, but their relationship becomes clear before the trip is ended.

*Glacial features.*—The gently rolling plains of Illinois and Iowa in contrast with the relatively flat country farther west present the depositional work of the Ice Age, and his curiosity to get onto a glacial moraine is aroused. This curiosity is satisfied by several side trips into the Teton Mountains. Here he sees and travels over the old glacial valleys, notes the characteristic U-shape given them by the glaciers, ascends them and observes the amphitheater-

shaped cirques at their head often containing small lakes which lie in the eroded rock basins, traverses the terminal moraine which encircles the mouth of the valley, and, still unsatisfied, he wants to "explore some more." Here the questions arise: What has become of the glaciers that once filled those valleys? When and why did they disappear? Was man here at the time? Did trees grow then as now? Will the glaciers ever come again? And he is not slow to tie up these problems with glacial conditions at home and the ancient lake that preceded Great Salt Lake. As he travels through Jackson Hole he is trying to solve the origin of the enormous amount of gravel that forms its floor, but by the time he has passed Jackson Lake—a large glacial lake at the north end—most of his difficulties have been cleared away. These, however are only a few of the many glacial problems that confront him.

*Running water.*—The broad valleys of the Mississippi, Missouri, and Platte, in contrast with the canyons of the Arkansas, Grand Lewis, and Yellowstone rivers, well illustrate for him the result of stream erosion in plains, mountains, and plateaus. The canyon of the Yellowstone probably leaves the most lasting impression. After climbing more than a thousand feet down its precipitous side and up again—in part by the use of a rope—after finding the cause of its beautiful coloring, after viewing it from many points along its brink, and realizing that the small stream flowing through it has done all the work since glacial times, he feels satisfied that his journey has been well worth while. His problems in stream erosion, however, do not end here because in passing through Hayden Valley he has noticed terraces along the valley sides similar to those around Great Salt Lake. To form these terraces the water must have been much higher than now, and Yellowstone Lake must have extended down Hayden Valley to some point near the Upper Falls. What happened to drain this Lake? With a little assistance he learns of the piracy of the Yellowstone, that the continental divide was shifted, that the drainage of Yellowstone Lake was changed from the Pacific to the Atlantic, and the falls of the Yellowstone were brought into existence. He reconstructs this ancient divide upon his map.

Mesas, buttes, natural bridges, sand bars, valley flats, fans,



fluvio-glacial deposits, terraces, and bad lands are a few of the other features that requires attention. Some demand more consideration than others and in the entire course the life relationships, especially plant and human, are emphasized more than the physiography or geology of the features themselves.

*Rocks and structures.*—No effort is made to study rocks in detail but during the trip the student becomes acquainted with the main classes and many specific kinds, such as igneous, sedimentary, metamorphic, and rhyolite, granite, gneiss, basalt, lava, obsidian, limestone, sandstone, etc. He learns these by constant contact with them and seeks an explanation of the conditions that produced such variations. I doubt if anyone can ask more “whys” than a boy in the field. During the journey to the field each student constructs a rough cross-section of the country from Chicago to Salt Lake City, indicating the classes of rock and the structure. In making this section he learns to recognize, not only the rock, but its position—dipping, folded, horizontal—and perhaps faulting. Another cross-section of the Tetons with their gentle western and steep eastern slope strengthens his confidence in interpretation and directs his attention to many points that might otherwise pass unnoticed. The construction of these sections leads to an explanation of mountain making and many original theories are deduced, often to be destroyed immediately by some other member of the party. It may be said here that all problems are left to the class and never solved by the instructor unless it becomes necessary. He points out errors in solutions offered and may make suggestions, but can usually bring about an agreement without answering the questions outright. A few of the larger problems presented for solution are: Explanation of terraces about Great Salt Lake; origin of Rocky, Teton, Gallatin, Absaroka, and Red mountains; explanation of Pitchstone Plateau and the whole plateau area of the Park; origin of Jackson Hole; what is the best use to which Jackson Hole can be put in the future?

*Ground water.*—The park is an unexcelled region for the study of hot springs, geysers, and mineral waters. The route followed presents to the student many of the minor features of this sort first, and ends with a study of such climax types as Emerald Pool,

Giant Geyser, and Old Faithful Geyser. Their origin, form, and kind of deposits, causes of the brilliant and beautiful colors are studied among the formations themselves. The student will discover for himself the differences between the terraced, calcareous formation about the Mammoth Hot Springs and the silicious deposits about the geysers. The explanation of petrified tree trunks standing erect above the surroundings, with glacial drift in the immediate vicinity, presents a situation that, at first, is hard for him to reconcile.

As previously stated, the above discussion does not pretend to cover all the field material studied. Considerable emphasis was placed upon plant life, especially ecological study. This phase of the work was in charge of Mr. W. L. Eikenberry of the University High School and was made a part of all written work and conference discussions. The deep interest of the boy in plant life and its geographic associations was apparent at all times, and the highest credit is due Mr. Eikenberry for keeping this interest at a high pitch. I do not consider that I have solved the problem of field geography, but if the establishment of this course in the University High School has contributed toward its solution I shall feel that the effort has not been in vain. Next season (1913) the same trip will be made during the early part of the summer with a second trip to Glacier National Park during the latter part. The latter trip will be made by pack train, as wagons cannot be used.